A5510-1 U 12/88

100 Park Avenue Suite 3600 New York New York 10017 (212) 683-7626 Telex 257272

Industrial Research Institute, Inc.

November 1988

I.R.I.'s 1989 R&D TRENDS SURVEY

The outlook for 1989 is much the same as 1988 although a more outward focus for R&D can be detected. Highlights follow:

- 79% of the respondents expect to spend the same or slightly more on R&D capital spending.
- 84% of the respondents plan little or no change in R&D capital spending.
- 68% of respondents will maintain R&D subcontracting at the same or slightly higher level.
- University funded R&D will be increased by 23% of the respondents.
- R&D expenses as a percentage of sales will be maintained at the same level of 1988 and 1989, although operational costs per professional will increase from $148,000 to $154,000.

There will be a significant sameness about expenditures in the research industry in 1989, although the returns from the I.R.I.'s fifth annual survey of industrial research trends generally suggest "slightly more" expenditures rather than "slightly less" for 1989 (see tabulation on next page). The tendency to "slightly more" appears clearer in the total R&D expenditures than in the capital expenditures, which are still balanced about their mid-point. Grants to universities indicate a "slightly more" tendency for 1989.

The I.R.I. survey was conducted by sending questionnaires to the official representatives of 252 U.S. member companies. Replies were received from 141. Respondents were asked to give their best present estimate of the relative change they saw ahead for 1989, compared with 1988, in several areas of R&D activity. A scale of 1-5 was used, with 1 representing "significantly less" (-5 percent or less compared with 1988), 2 "slightly less" (0 to -5 percent), 3 "approximately the same" (1-5 percent), 4 "slightly more" (6-15 percent), and 5 "significantly more" (more than 15 percent). Respondents could also check "NA" for "not applicable" and "NR" for "not important to you."

In response to the questions about effort allocation, the "same" column appears to predominate except in new business projects where there is a significant trend toward "slightly more", which shows a figure of the same magnitude as the "same" figure. The other significant change is in a preponderance of "slightly more than" in R&D efforts in response to existing or proposed legislation, standards, or other government rules. More specifically:

The data in this survey were tabulated by Eliot Steinberg of the I.R.I. staff; interpretation was prepared by Michael R. Waller (Amoco Production Company), chairperson of the Research-on-Research Committee.

Table 1. Forecast of 1989 Trends by Industry

	R&D as % of Sales		Operational Costs of R&D (x $000)		Capital Expenditures for R&D as % of budget			R&D Profs. as % of total R&D	
	1988	1989	1988	1989	1987	1988	1989	1988	1989
Chemicals (30 companies)	3.8	3.7	153	157	14	14	14	61	61
Electrical (10 companies)	4.8	4.9	154	160	14	16	14	64	65
Food (11 companies)	.6	.6	112	116	13	18	15	64	65
Machinery & Fabricated Metal (13 companies)	2.2	2.0	121	126	15	15	12	49	47
Paper & Allied Products (8 companies)	1.2	1.2	140	145	12	13	12	56	57
Petroleum (11 companies)	.7	.8	200	208	9	13	12	56	57
Pharmaceuticals/Personal Care Products (11 companies)	7.3	7.4	155	161	13	16	17	61	61
Primary Metals (7 companies)	1.4	1.3	138	142	13	14	14	45	49
Others (19 companies)	3.1	3.1	152	156	15	11	12	58	60

- A preponderance of respondents (73%) expect their R&D programs, characterized as support of existing business, directed basic research, and new business projects, to be maintained at either the same level or a slightly greater level.
- A majority (83%) indicate the same degree or slightly more of outside customer technical service work.
- R&D efforts needed to respond to governmental requirements continue its leveling off with 85% of the respondents planning no or little change in the need to increase R&D efforts for this.

Asked about personnel trends, 36 percent of the respondents expect some increase in their professional manpower level during 1989 and 28 percent expect to hire more new graduates.

Under "Other Trends": Top management attention to research on longer term, more strategic issues is equally divided between "same as" and "slightly more than," as is top management attention to development and participation in alliances and joint ventures for R&D. These directions no doubt relate to the increased interest in new business shown in a previous category. Contacts with federal laboratories is up slightly in the 1989 answers, as is licensing technology to others. These trends all suggest a more outward looking directon for R&D in 1989 supporting the themes of the last several I.R.I. general meetings.

Table 2. Survey Questionnaire Results

Expected Changes in 1989 Compared with 1988 Experience	Relative Change (Number of Responses) NA	1	2	3	4	5	NR
Expenditures							
1. Total R&D expenditures	0	11	9	71	41	9	0
2. Ratio of direct salaries and wages to other direct R&D costs	1	2	11	109	14	0	4
3. Capital spending for R&D operations	0	7	24	69	26	14	0
4. Subcontracting R&D to outside commercial organizations	12	5	12	80	24	4	3
5. Grants, contracts, etc. for university R&D	6	2	12	86	32	3	0
Effort Allocation							
6. Relative distribution of R&D costs;							
a. Support of existing business	0	3	22	83	28	5	0
b. Directed basic research*	13	9	17	73	24	4	1
c. New-business projects	2	9	18	52	49	11	0
7. Ratio of non-centralized (e.g., divisional) to centralized corporate R&D efforts	14	1	21	77	14	7	5
8. Outside-customer technical-service efforts relative to total R&D (in time or dollars)	7	2	10	96	21	1	4
9. R&D efforts in response to existing or proposed legislation, standards, or other governmental rules (in time or dollars)	5	1	12	84	36	2	1
Personnel Trends							
10. R&D professional manpower level	0	8	17	65	46	5	0
11. Hiring new graduates	5	5	11	68	36	3	0
Other Trends							
12. Top management attention to Research on longer term or strategic issues	2	5	11	55	56	12	0
13. Top management attention to Development	0	1	9	60	61	10	0
14. Participation in consortia for precompetitive university research	24	1	13	78	16	2	5
15. Participation in alliances and joint ventures for R&D	18	3	5	65	45	4	1
16. Licensing technology from others (dollar volume)	12	1	12	89	17	2	8

(continued)

Table 2 (continued)

Expected Changes in 1989 Compared with 1988 Experience	Relative Change (Number of Responses)						
	NA	1	2	3	4	5	NR
17. Licensing technology to others (dollar volume)	16	0	11	80	25	3	4
18. Extent of government financial support of R&D	46	3	17	56	11	3	5
19. Contacts with Federal Laboratories	31	1	7	63	23	6	10
20. Overhead costs	1	5	21	97	14	3	0

Quantitative Data

21. What is your capital expenditure for R&D as a percent of your R&D Budget?
    1987 13% 1988 14% 1989 14%
22. R&D expenditures as percent of sales: 1988 3.1%; anticipated for 1989 3.0%
23. R&D professionals as percent of total R&D personnel: 1988 58%; anticipated for 1989 58%
24. Operational costs per R&D professional**
    a. for 1988 $148,000
    b. estimate for 1989 $154,000

*Research whose outcome may be unknown at the time the work is undertaken but where there's a reasonable expectation that findings will be valuable to the supporting organization.

**Refers to actual cost of operating the laboratory. Numerator consists of such costs as salaries (professional and non-professional), fringe benefits, travel, training, supplies, secretarial, managerial, analytical and testing services in-house and outside, utilities, taxes and depreciation. Denominator includes total number of technical professionals at the laboratory whether they are in technical or managerial activities.

Again in 1989, 24 companies chose the "not applicable" box on the question of participation and consortia for precompetitive university research. A large number also indicated the "not applicable" column in connection with contacts with federal laboratories, the extent of government financial support of R&D and participation in alliances and joint ventures in R&D. The high "not applicables" in contacts with federal laboratories contrasts with the strong desire to monetize federal laboratory results in the last several years. More specifically:

- 56% indicate that top management will increase its attention to R&D.
- Although 68% indicate the same or slightly higher level of participation in consortia for precompetitive university research, 35% expect to increase participation in R&D alliances and joint ventures.
- Approximately 75% expect the same or slightly greater effort for licensing technology to and from others.
- 48% expect the same or slightly more government financial support of R&D within their companies. 36% of the respondents reported that government support is not applicable to their R&D operations.
- Whereas 45% of respondents will maintain the same level of contacts with federal laboratories, 21% expect an increase in such contacts.

Finally, the forecast of 1989 trends by industry (see table on the second page) reveals that R&D as a percent of sales is lowest for the food companies, where the operational cost of R&D professionals is $116,000, and for the petroleum companies, where the operational cost of R&D professionals is $208,000. However, there is no clear correlation between these two criteria or numbers.